ISSN 2515-8260 Volume 9, Issue 7, 2022

FIELD RESEARCH CONDUCTED ON UZAN PROCESSES IN THE LOWER AREA OF AMUDARYA WATER ABSTRACT

Ishankulov Zhohidjon Mamasolievich
Andijan Institute of Agriculture and Agrotechnologies
Senior teacher of the department "Hydrotechnics and reclamation facilities".
Andijan, Uzbekistan

Abstract. This article presents the results of the field research conducted on the identification of watershed processes in the lower water intake area without the Amudarya dam. As a result of the study of riverbed processes in rivers that have passed through rapidly leaching soils, hydraulic schemes of the factors that cause local washing of the shore, taking into account stable and unstable movement in the stream, have been developed.

Key words. Watercourse processes, runoff, water intake without dams, water level, water consumption, depth, water velocity, flow.

Introduction. Deformations determining the processes in Uzan are mainly divided into natural and artificial forms. Natural deformations are characterized by periodic occurrence in a certain sequence in riverbeds. Artificial deformations occur under the influence of hydrotechnical facilities built in the river bed or facilities receiving water from the river bed. These deformations are divided into local and general deformations. Natural deformations mainly occur as a result of changes in the hydrological regime and flow regime of the river, and develop with certain dynamics along the cross-section and along the length of the riverbed. Of course, climate change is expanding the scope of these types of deformations. The instability of riverbeds mainly depends on the change in the distribution of sediments along the length of the riverbed and the change in the saturation of the stream with sediments. Such development of processes in Uzan often interferes with the economic activities of mankind. In many cases, the deformations of the river cause great damage to the national economy. For example, siltation of the bottom of the riverbed and elevation of the elevation mark can lead to a rise in the water level and flooding of productive lands and settlements. Or, as a result of a sudden change in the water level, the humidity of the riverbanks changes dramatically, and the large massif is washed away, leading to the washing away of several large settlements. The planar and vertical acceleration of riverbed deformations complicates the working conditions of many water intake structures. For example, the issue of guaranteed water supply to the main facilities becomes more difficult when receiving water without a dam. In the main channel of Karshi, the river is constantly moving to

ISSN 2515-8260 Volume 9, Issue 7, 2022

the left, and the main channel is moving away, while in the Amu-Bukhara machine channel, the river is constantly moving away. In the Karakum channel, the change of the hydrological regime forms a very complex phenomenon. The scale of deformation processes in the lower reaches of the Amudarya is characterized by large-scale occurrence. Many researchers were engaged in determining the nature, speed and directions of natural deformation processes [3,5,10].

S.T.Altunin, S.Kh.Abalyans, A.M.Mukhamedov, X.A.Irmukhamedov, X.A.Ismagilov, I.A.Buzunov, R.Urkinbaev, J.Kuchkarov, M.R.Bakiyev, D.R.Bazarov, M.R.Ikramova, N.Rakhmatov, B.Norkulov and several other scientists were involved. Recommendations are given to prevent washing of the coast as a result of the change in the direction of the flow during the operation of water intake structures without dams. The research conducted by them has an effective solution in the process of operation and is giving its results.

Currently, problems such as assessing the main hydrodynamic parameters and deformation processes of the flow in the lower area of the damless water intake from the river, taking into account the distribution of the flow and adopting solutions to prevent coastal washing, improving the methods of their hydraulic justification are sufficiently developed. not studied. Therefore, there is a need to develop methods for calculating local leaching processes in the lower area of a damless water intake facility.

Research methods. In the course of research, experimental, field-observation methods, commonly accepted methods used in hydrology and hydraulics, theoretical equations and mathematical and statistical scientific research methods were used to justify the processes occurring in the reservoir.

Research results. The conducted studies showed that the local rapid change of easily washed banks of the Amudarya occurs mainly during periods of flooding, while this situation can also occur during low water. In the middle parts of the Amudarya in February, when the water consumption was Q = 400 m3/s, rapid washing of the left bank was observed. Degish took place in different parts of Amudarya Kerki sh. from October to May, the planned displacement of the coasts was 800-900 m. During the flood, 700-800 m of coastline was washed away 20 km above the city of Chorzhou. [1-5, 11]

The main factors that cause the narrowing of the stream are the shapes in the large riverbed and the angle of the current spreading to the shore.

ISSN 2515-8260 Volume 9, Issue 7, 2022

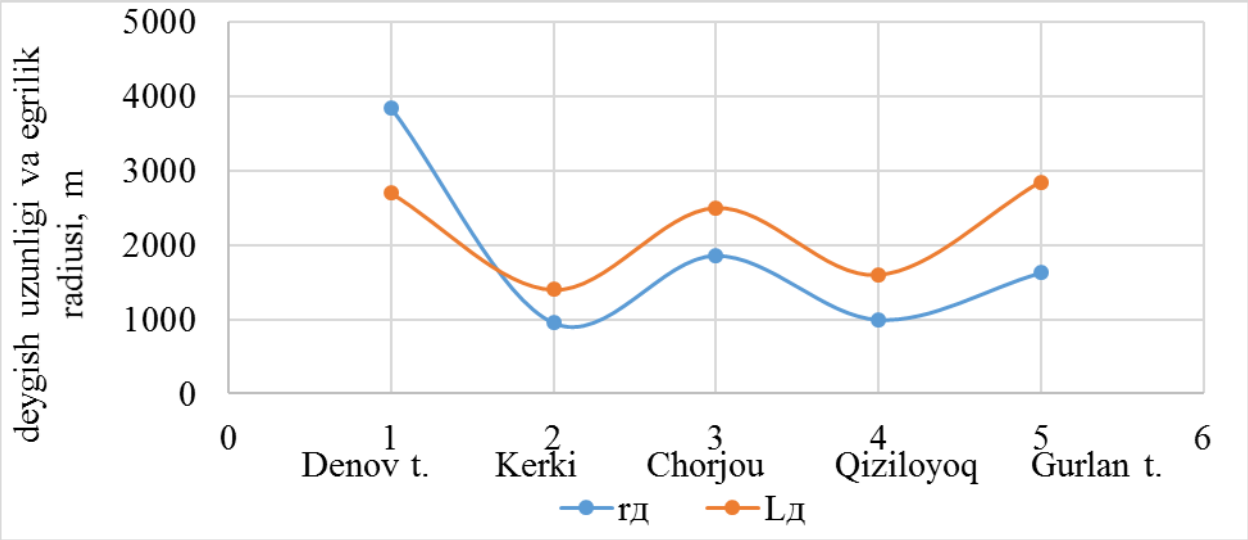


Figure 1. Morphometric description of the river bed in the Deigish area of the Amudarya River, Ld - the length of the coastal wash, m; rd is the radius of curvature of the flow axis in the flow zone, m.

It will be possible to discover the following patterns in the flow of bottom sediments in Amudarya. The river gradually narrows and widens. In accordance with this, the signs of the Uzan are legally changed. When in the upper parts of the valley expansion, the scouring occurs more in the channel changes, in the lower parts of this expansion, the process in the channel is more in the direction of accumulation. Sediment entrainment narrows the channel downstream of the expansion, making it less permeable and causing scour upstream of the next expansion. The sediments accumulated in the lower part of the expansion are washed away, their flow increases as a result of washing along the narrowing, and the symptoms of sediment accumulation occur in the upper part of the expansion. They disappear as soon as sediment begins to accumulate again at the bottom of the next extension. In Amudarya, one can observe that the sign of change changes once every 2 years. [10, 14]

Figure 2 shows the plan of the Amudarya section and characteristic longitudinal and cross-sections of its territory in the KMK section. Vertically

The speed distribution at the maximum depth of 4.7 m is unique. The speed at the depth of 0.98h is 0.46 m/s, while at the depth of 0.80h it is slightly less than 0.41 m/s. In the remaining verticals, the velocities are distributed according to the indicated curve.

ISSN 2515-8260 Volume 9, Issue 7, 2022

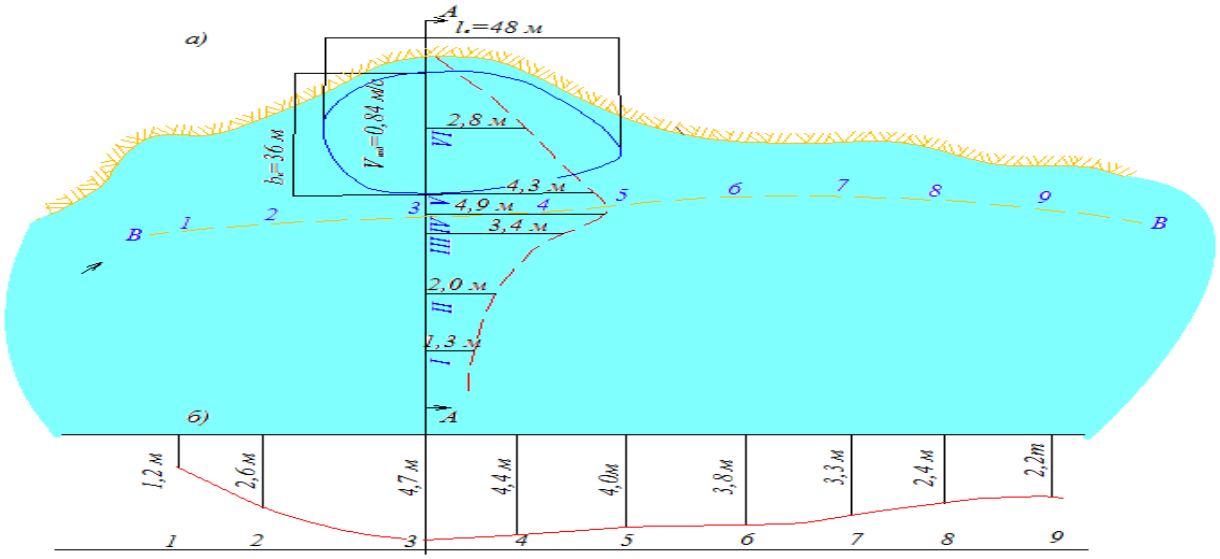
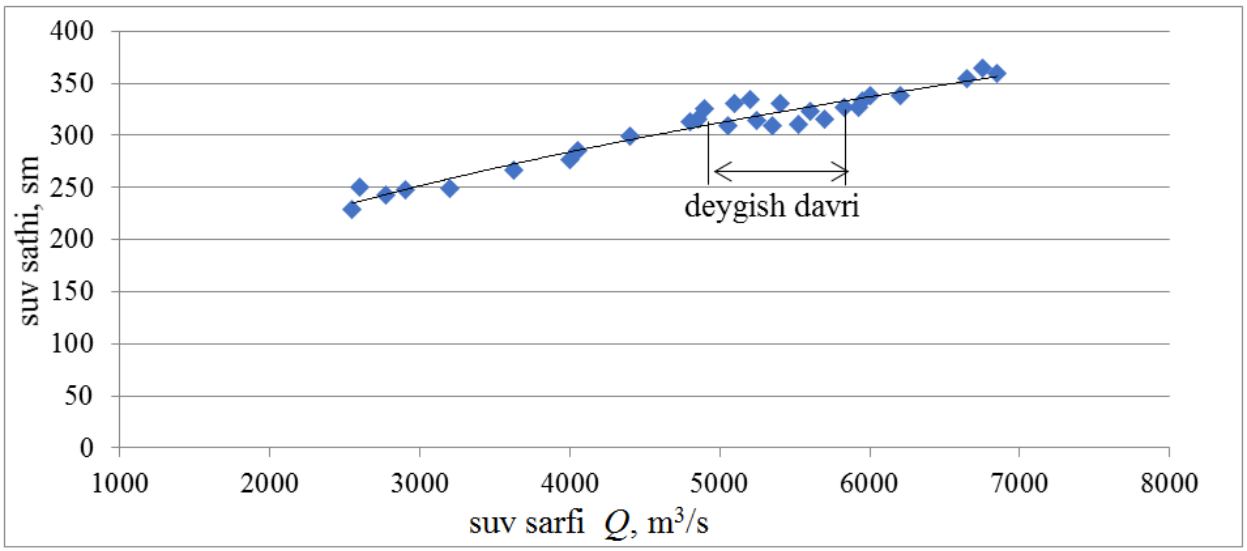


Figure 2. The left bank of the Amudarya in the KMK section in a uniform period with a cross-section (ring line) of the bed of the river bed (a) in the A-A axis (the epicenter of the flow) and a longitudinal section along the dynamic axis B-B of the flow (b)

$l_ϑ = 48m$, average surface water circulation speed in the funnel $ϑ_{ayl} = 0.84m/s$ the area of water circulation is indicated. The displacement of the eroding coastline up to 30 meters in length reaches 5 meters in 30 minutes. It was observed that the most intensive local washing of the $H = H(Q)$ shores corresponds to the period of the appearance of a specific swampy trap in the graph (Fig. 3). The most rapid washout occurs at a decrease in turbidity, when the slope of the water surface increases from steep to low, that is, towards the inclined shore, by 2-3 times, and in some cases up to 10 times, and the local speed of the current running to the shore increases suddenly [10, 11].



ISSN 2515-8260 Volume 9, Issue 7, 2022

Figure 3. Dependence of level (H) on water consumption (Q) in the dry season in Degish area in the middle part of Amudarya

Thus, sediment transport is carried out in this river with periodically increasing and decreasing particles. Of course, the formation of new beds in the river bed leads to the rejection of the stream, including towards the bank of the bed. If this happens at high levels, the local velocities will increase (3-4 m/s), which will cause rapid washing of the coasts. The banks of the Amudarya are usually covered with loess material, which has the ability to support steep walls, so washing occurs suddenly when the bank collapses.

In addition, the change of the main riverbed of the Amudarya occurs due to the increase of water intakes, the overloading of the river structure due to the frequent dumping of sediments during the cleaning of the river bed below the water intake. This led to the formation of sediments and the rise of the bed of the riverbed, which in many cases affects the shift of the main stream to the left bank. As a result, there is a change in the cut of the river bed, and the main river bed spreads over a wide area. A fluctuating bed is formed in the catchment area, and seepage is observed in places close to rapid washing, especially on the left bank of the river below the main catchment structure of KMK. In the period of 2010-2017, the washing area under the Main Water Intake Facility of KMK was 200-250 ha in a strip 100-300 m wide. In this area, the area of washing on the coastal surfaces of the Amudarya's spreading channel was 170-200 ha. The total washing area was 300-450 ha. Based on the condition of the riverbed in the area of the village of Kiziloyak, with a rapid change in the planned situation and the rise and fall of the flood due to the re-formation of the main riverbed, an emergency situation may occur and the inhabited areas of the village of Kiziloyak may be destroyed [10,11,13,14].

In the research facility, several streams were selected, field observations were conducted, and based on this, the dynamics of stream hydraulic parameters were analyzed.

ISSN 2515-8260 Volume 9, Issue 7, 2022

Figure 4. Depth measurement works in the catchment area of KMK

In the research area, a graph of the dynamics of change in the cross-section of the bottom of the river bed was constructed. As can be seen from Figure 5, under the influence of the damless water intake main structure, the flow is redistributed, the height of the riverbed in the right and middle tributaries rises, and the process of tributary reshaping is underway.

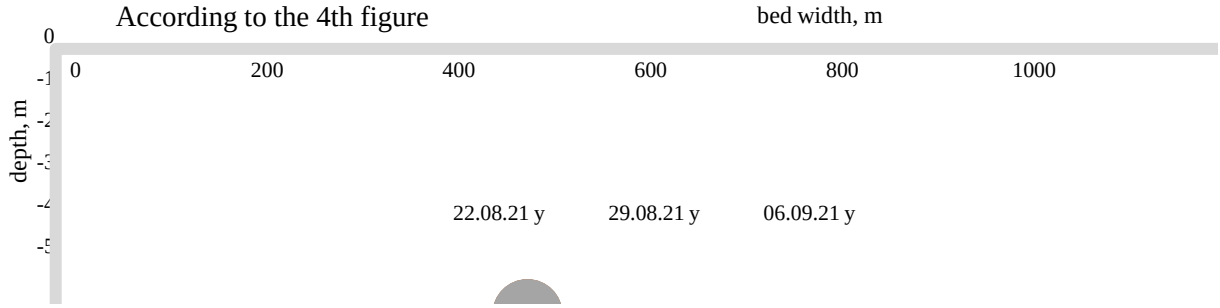


Figure 5. Dynamics of the bottom cross-section of the lower part of the Amudarya basin in the catchment area without dams of KMK

An increase in the flow of water into the channel causes a decrease in the depth of the flow of water moving in the channel and an increase in the width of the channel. This situation, in turn, leads to the emergence of a dynamic balance. The expansion of the channel width leads to an increase in the width of the flow front and ensures their transport. The change in depth was compared in the water catchment area of KMK.

According to the results of depth measurement, it is explained by the fact that the current in the area is very unstable and highly mobile, and in a short period of time large processes of the river bed may occur. This shows that the hydraulic regime of the river significantly redistributes the speed, depth and width of the flow.

ISSN 2515-8260 Volume 9, Issue 7, 2022

When determining the depth of the observation point, it was determined how many points should be measured depending on the vertical depth (h) along the width of the river.

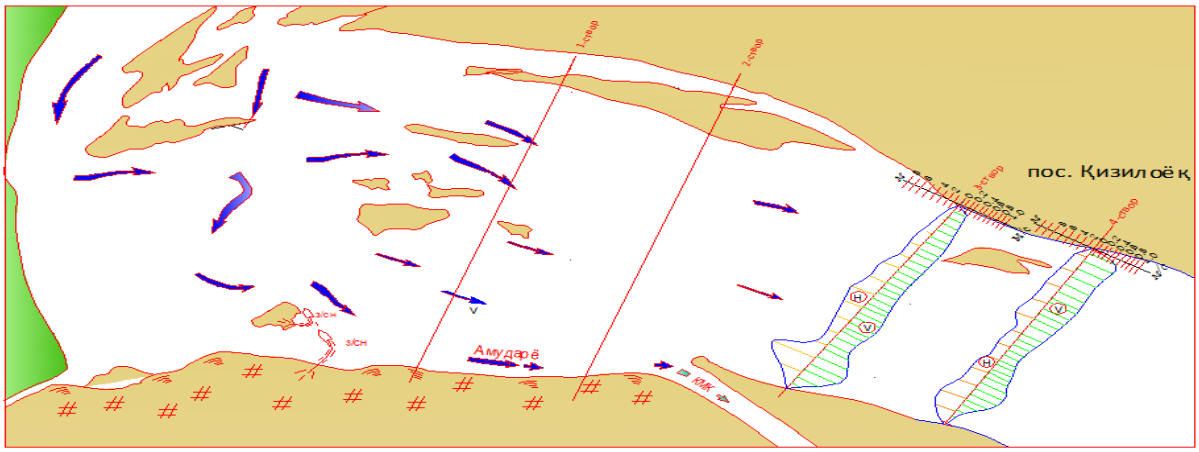
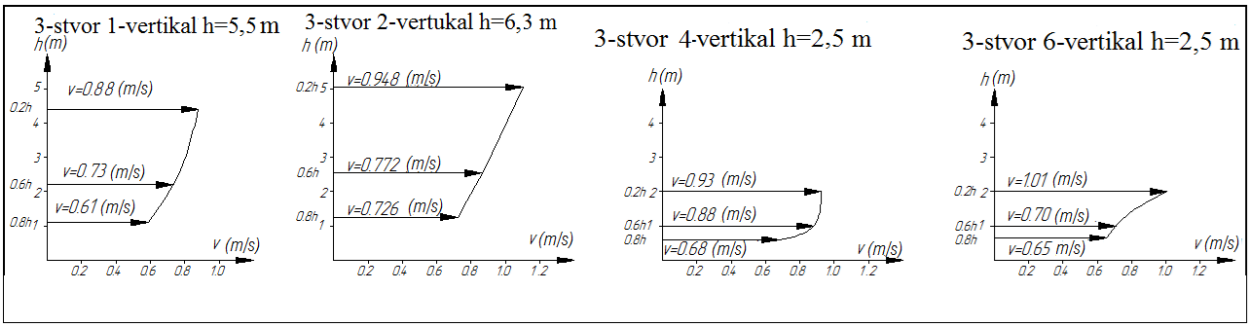


Figure 6. Distribution of depth and velocities in the cross section of the KMK catchment area.

When the average speed of the flow is in the range of 0.5-3.5 m/s, it was observed that the water intake from the river without a dam has the maximum value of the depth of the stem near Pulizindon rock. The dynamics of the depth change showed that when the water level rises, the height of the river bed rises, and during low water it decreases. It should be noted that, although the average speed of the flow in the research area is several times higher than the allowable non-washable speed for this ground, which crosses the river bed, deformations do not occur at a significant depth. The reason for this can be justified by the high saturation of the flow with discharge in the area of the research object. The fractional composition of fluids suspended in this area and sliding along the bottom of the riverbed also shows the validity of our opinion.

Researching the dynamics of river sediment distribution and applying its results in practice is of great scientific and practical importance. The design of hydrotechnical structures and channels requires taking into account the mode of deposition or transport of sediments and the effect of the constructed structure on the conditions of sediment flow.



ISSN 2515-8260 Volume 9, Issue 7, 2022

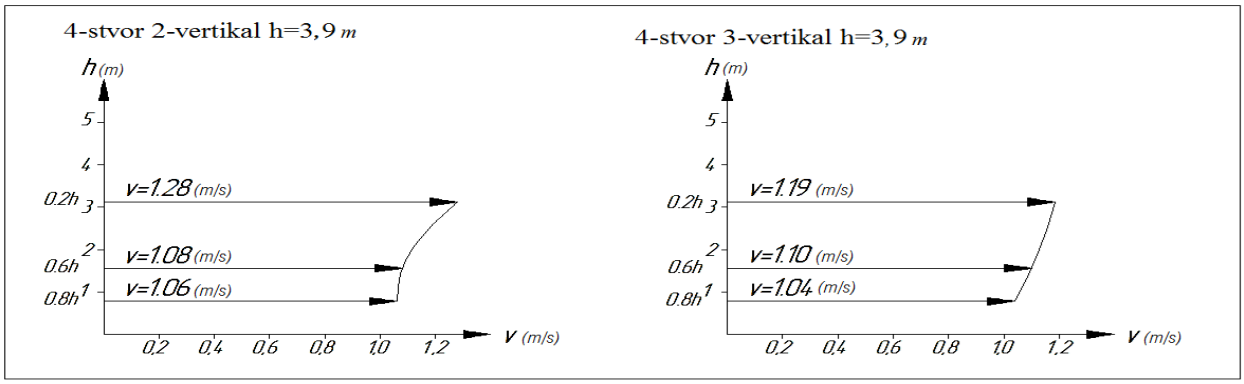


Figure 7. Variation of flow velocity with depth in verticals in selected walls

In this area, the graphs of the relationship between the water level and consumption have a variable character.

Conclusions: Based on the results of the research carried out in the area of the main water intake structure of the Amudarya Middle Stream KMK without a dam, the following conclusions can be made:

1. It was found that the average speed of the flow in the area of the main water intake facility without a dam of KMK is several times greater than the non-washable speed determined for the soils of the Amudarya river. Sudden changes in flow rate and level, high speed, saturation of the stream with moving and suspended fluids along the bottom of the bed, and sudden changes in the nature of their migration cause the bed to constantly change and deformation processes in the plan. increasing speed. As a result of the discharge of sludge from the treatment of sewage entering the opposite main channel, the riverbed is narrowing in the lower bank, and the left bank is being washed away. Based on this result, it was recognized that there is a need for more accurate level of research in the future.

2. According to the results of hydrometric measurements carried out in the lower part of the catchment area without a dam, the rate of dike displacement was 1 m/day when the water level was low, and when the water level was high It was 10-15 m/day. In winter, when the level was high, this amount was 4 m/day. The length of the coast is from 0.5-1.5 km to 10 km. From July 7 to September 10, 2021, the left bank moved by 110 meters. In 2019-2021, 15-30 meters of Amudarya coast was washed for 30-40 minutes. Taking into account the high cost of concrete and iron constructions, it is advisable to use local materials in the construction of protective structures.

3. As a result of experimental studies, the erosion zones of the banks (development of currents) were identified in the curved valleys, and the method of protecting them from erosion was improved.

4. When the water is low, the main current flows along the left bank, or the water flow on the left and right banks is almost the same. The main stream flows completely to the left of the undammed catchment into the coastal zone, producing turbid deposits. This showed the rapidity of the processes of Uzan in Uzan.

5. The results of field research in the Amudarya river basin section show that the characteristic longitudinal and transverse sections of the Deygish area and average surface water circulation velocity in the catchment are the limit of water circulation was determined.

The displacement of the eroding coast, which was up to 30 meters, reached 5 meters in 30 minutes. According to the results of the research, the most intensive local washing of the coasts it was found that it corresponds to the period of the appearance of a unique sloppy node in the graph. Hydraulic schemes have been developed that show that the most rapid washout occurs when the turbidity decreases, the water surface slopes from steep to low, i.e., towards the inclined shore, by 2-3 times, and the local speed of the flow towards the shore increases.

References

1. Абидов М.М. Регулирование наносного режима при водозаборе на горно-предгорных участках рек: дис. канд. техн. наук: 05.23.07 М., 2006. – 199 с.

2. Базаров Д. Р. Научное обоснование новых численных методов расчета русловых деформаций рек, русло которых сложены легкоразмываемыми грунтами, Дис. на соискание уч. степени д. т.н., М., 2000, 249с.

3. Базаров Д.Р, Норкулов.Б.Э, Жумабаева Г.У, Артикбаева Ф.К, Пулатов С.М, Особенности гидрологических характеристик среднего течения реки Амударья. “Аграрная Наука” научно-теоретический и производственный журнал. ISSN 0869 – 8155 №6-2019.г. Москва.

4. Базаров Д.Р., Норкулов Б, Рузимухамметова Д.М. “Изменение гидрологического режима реки при бесплотинном водозаборе”., Архитектура, Строительство, Дизайн. № 4, 2011г. С-39-41.

5. В.С.Алтунин, С.А.Аннаев, С.А.Аширов, Натурные исследования разрушения берегов (дейгиш) на средном участке р.Амударьи. Труды IV всесоюзного гидрологического съезда.Том 10. 44-49 стр.

6. Д.Э. Махмудова, Х.М. Дурдиев Р.А. Эрманов. К выбору нового устойчивого бесплотинного водозабора из р. Амударья для обеспечения надежного водообеспечения южных регионов Узбекистана. Режим доступа http://mail.icwc-aral.littel.uz/library/rus/hist/sbtr-saniiri-1984/pages/056.htm

7. Кловский А.К, Совершенствование конструкций бесплотинных водозаборных гидроузлов с донными циркуляционными порогаминамалых горных реках, Автореферат на соискание ученой степеникандидата технических наук. Москва 2015 г.С-155.

8. Крутов А.Н. Перспективы применения численного моделирования русловых процессов// Актуальные проблемы водного хозяйства и мелиорации орошаемых земель, Материалы Республиканской научно-практической конференции, Ташкент, Узбекистан, 2011, стр. 124-129.

9. Мухамедов Я.С. Регулирование русла и режима наносов Амударьи у бесплотинных водозаборов руслорегулировочными сооружениями. Режим доступа http: // mail.icwc-aral.littel.uz/library/rus/hist/sb-tr-saniiri-1984/pages/056.htm

10. Мухаммедов Я. С. Эксплуатация Каршинского магистрального канала при водозаборе из р. Амударьи и пути его улучшения. Режим доступа: http://www.cawaterinfo.net/library/rus/mukhamedov1.pdf 2021 йил 26-27 март 44

11. Шульц В.Л. Реки Средней Азии [Текст]: [В 2 ч.] / Глав. упр. гидрометеорол. службы при Совете Министров СССР. Среднеаз. науч.-исслед. гидрометеорол. ин-т. - [2-е изд., перераб.]. - Ленинград: Гидрометеоиздат, 1963.

12. Bazarov, D., Markova, I.,Norkulov B. Isabaev, K., Sapaeva, M. “Operational efficiency of water damless intake”

13. Bazarov.D, Norkulov.B, Vokhidov.O, Uljaev.F, Ishankulov.Z, Two-dimensional flow movement in the area of protective regulatory structures. STCCE-2020. Materials Science and Engineering. doi:10.1088/1757-899X/890/1/012162

14. Krutov A., Bazarov D., Norkulov B., Obidov B., Nazarov B. 2019 Experience of employment of computational models for water quality modelling. E3S Web of Conferences. EDP.